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(12) # EUROPEAN PATENT APPLICATION

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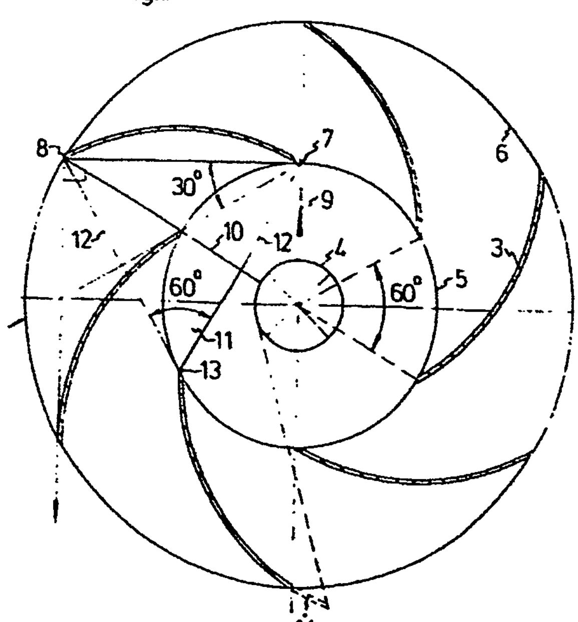
(54) **Omnidirectional reflector.**

(57) The present invention relates to an omnidirectional reflector having a light source (4) situated in the centre thereof, said reflector being adapted to project a light distribution giving a generally even illumination on the plane under the reflector. This reflector is composed of a number of segments (3) of reflector material which are arranged around the light source (4) and turned helically in the vertical sense of the reflector, said segments at least substantially enclosing the light source (4) and forming a symmetrical body.

Fig.2



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OMNIDIRECTIONAL REFLECTOR

The present invention relates to an omnidirectional reflector having a light source situated in the centre thereof, said reflector being adapted to project a light distribution giving a generally even illumination on the plane under the reflector. Characteristic of the reflector is that it is composed of a number of segments consisting of reflector material which are arranged around the light source and helically turned in the vertical sense of the reflector, said segments at least substantially enclosing the light source and forming a symmetrical body.

The invention and the theory of it will be described more fully below with reference to the accompanying drawings, in which:

Fig. 1 shows a vertical cross-section of a per se known rotation-symmetrical omnidirectional reflector;

Fig. 2 shows a horizontal section of a preferred embodiment of the omnidirectional reflector according to the invention;

Figs. 3 and 4 are side views showing two different embodiments of the reflector according to the invention; and

Figs. 5-7 show a reflector segment, as seen from three different directions, according to the embodiment shown in Fig. 3.

As appears from Fig. 1 a rotation-symmetrical omnidirectional reflector has the form or curvature apparent from the curve extending between points 1 and 2 which normally consists of a parabola or ellipse. This curve has been modified to project the light distribution $I_a = f(a)$ which is to give an even horizontal illumination in lux on the plane under the reflector. How large the illuminated surface will be is determined by the height of the reflector above the plane but also to a high degree by the angle b, i.e. how broad-radiating the reflector is.

The light strength can be defined as $I_a = A \cdot L \cdot \cos b$, where A is the luminant surface, L is the luminance of this surface and b the angle which this surface forms with the illuminated plane. From this it is apparent that the reflector should have a large area to give as high an efficiency as possible.

The reflector according to the present invention is composed of a number of circle segments 3 which helically or spirally enclose a light source 4 completely or almost completely. As appears from Fig. 3 the segments form a major or minor portion of a sphere. According to Fig. 4 the segments form a cylinder. The segments can also form figures derived from the forms shown in Figs. 3 and 4.

By constructing the reflector in the following manner it is possible to create a large-area reflector giving a high and even lighting level on the plane under the reflector.

When an omnidirectional effect is desired the reflector is constructed so that each segment in a horizontal plane will have a radiation angle corresponding to 360° divided by the number of segments.

The preferred reflector shown in Fig. 2 is built up of six segments 3 and each segment should consequently have a radiation angle of 60°. The segments 3 are evenly distributed around the light source 4 and disposed between two concentric circles, the inscribed circle 5 and the circumscribed circle 6, arranged around the light source 4. Between these circles straight lines are drawn from a tangential point 7 on the inscribed circle 5. The angular distance between the tangential points 7 will in this case be 60°. A beam 9 from the light source 4, which strikes in point 7, is to be refracted at an angle of 30° from line 7-8; in a corresponding manner a beam 10 from the light source 4, which strikes in point 8, is to be refracted at right angles outwards towards line 7-8. This is effected in that the line 7-8 is allowed to constitute the base of an isosceles triangle the apex 13 of which constitutes the

centre of curvature for the segment 3 having the form of a circular arc extending between points 7 and 8. The radius 12 of the circular arc is thus equal to the side in the isosceles triangle.

The number of segments 3 in the reflector is at least four and preferably six. According to Fig. 2 the number of segments 3 is six. In this case the isosceles triangle will be equilateral provided that the circumscribed circle 6 has the double diameter of the inscribed circle 5. Hence the top angle 11 is equal to 60°. As the angle between the outgoing beams 9 and 10 is 60° the radius of the circumscribed circle 6 will quite simply be twice as large as the radius of the inscribed circle 5 when the segments 3 are six in number.

As a light source 4 normally has a certain extent the circle segments 3 may be allowed to continue a distance outside the circumscribed circle 6 at 14 in order to screen off the light source 4 without therefore substantially impairing the other light characteristics of the reflector.

The reflector is made in that each segment 3 is turned helically upwards or possibly also downwards round the light source 4 in such a way that the point 7 moves at the same distance from the centre and where the angle gradient in the inclination of the spiral or helix gives the corresponding inclination of the light beam in relaticn to the vertical line as that which would be obtained in a equivalent section in the rotation-symmetrical reflector.

If the circles described above, the inscribed circle 5 and the circumscribed circle 6, have unchanged diameters throughout the height, then the segments 3 form together a cylinder-shaped reflector which is shown in Fig. 4. The tangential point 7 described above can also move upwards at a varying distance from the centre so that a spherical shape will be obtained, as shown in Fig. 3.

It will be clearly apparent that if the point 7 moves spirally upwards with a certain angle gradient the point 8 will at the same time move upwards with a higher angle gradient. Thus, it will be the spiral shape along the

inscribed circle 5 that decides the screening-off angle of the reflector, i.e. the highest angle in relation to the vertical line over which no beams are reflected.

The invention is not restricted to that described above and shown in the drawings but may be modified within the scope of the appended claims.

CLAIMS

1. Omnidirectional reflector having a light source situated in the centre thereof, said reflector being adapted to project a light distribution giving a generally even illumination on the plane under the reflector, c h a r a c t e r i z e d in that it is composed of a number of segments (3) consisting of reflector material which are arranged around the light source (4) and are helically turned in the vertical sense of the reflector, said segments at least substantially enclosing together the light source (4) and forming a symmetrical body (Fig. 3; Fig. 4).

2. Omnidirectional reflector as claimed in claim 1, c h a r a c t e r i z e d in that the segments (3) are evenly distributed around the light source (4) and arranged between two concentrical circles (5, 6), the inscribed circle (5) and the circumscribed circle (6), disposed around the light source (4).

3. Omnidirectional reflector as claimed in claim 2, c h a r a c t e r i z e d in that the segments (3) are helically turned in the vertical sense of the reflector between the inscribed circle (5) and the circumscribed circle (6), the diameters of which are constant throughout the height, so that the segments (3) will together form a cylinder-shaped body (Fig. 4).

4. Omnidirectional reflector as claimed in claim 2, c h a r a c t e r i z e d in that the segments (3) are helically turned in the vertical sense of the reflector between the inscribed circle (5) and the circumscribed circle (6), the diameters of which vary in the vertical sense, so that the segments (3) will together form a spherical body (Fig. 3).

5. Omnidirectional reflector as claimed in any of claims 1-4, c h a r a c t e r i z e d by comprising at least four and preferably six segments (3).

6. Omnidirectional reflector as claimed in claim 5, c h a r a c t e r i z e d in that the segments (3) are shaped and arranged such that in a horizontal plane they will have a radiation angle corresponding to 360° divided by the number of segments (3).

7. Omnidirectional reflector as claimed in claim 6, c h a r a c t e r i z e d in that the segments (3) have the form of a circular arc in cross-section, the circular arc extending from the tangential point (7) of a straight line on the inscribed circle (5) to the intersection point (8) of said line with the circumscribed circle (6).

8. Omnidirectional reflector as claimed in claim 7, c h a r a c t e r i z e d in that the circular arc of the segments (3) has its centre of curvature at the apex (13) of an isosceles triangle the base of which consists of the straight line between the tangential point (7) thereof on the inscribed circle (5) and the intersection point (8) thereof with the circumscribed circle (6).

9. Omnidirectional reflector as claimed in claim 8, c h a r a c t e r i z e d in that the isosceles triangle, in the apex (13) of which the circular arc of the segments (3) has its centre of curvature, is equilateral when the circumscribed circle (6) has the double diameter of the inscribed circle (5) and the reflector includes six uniformly distributed segments (3).

10. Omnidirectional reflector as claimed in any of claims 2-9, c h a r a c t e r i z e d in that the segments (3) reach somewhat outside (at 14) the circumscribed circle (6) so that they will compensate for the extent of the light source (4).

Fig.1

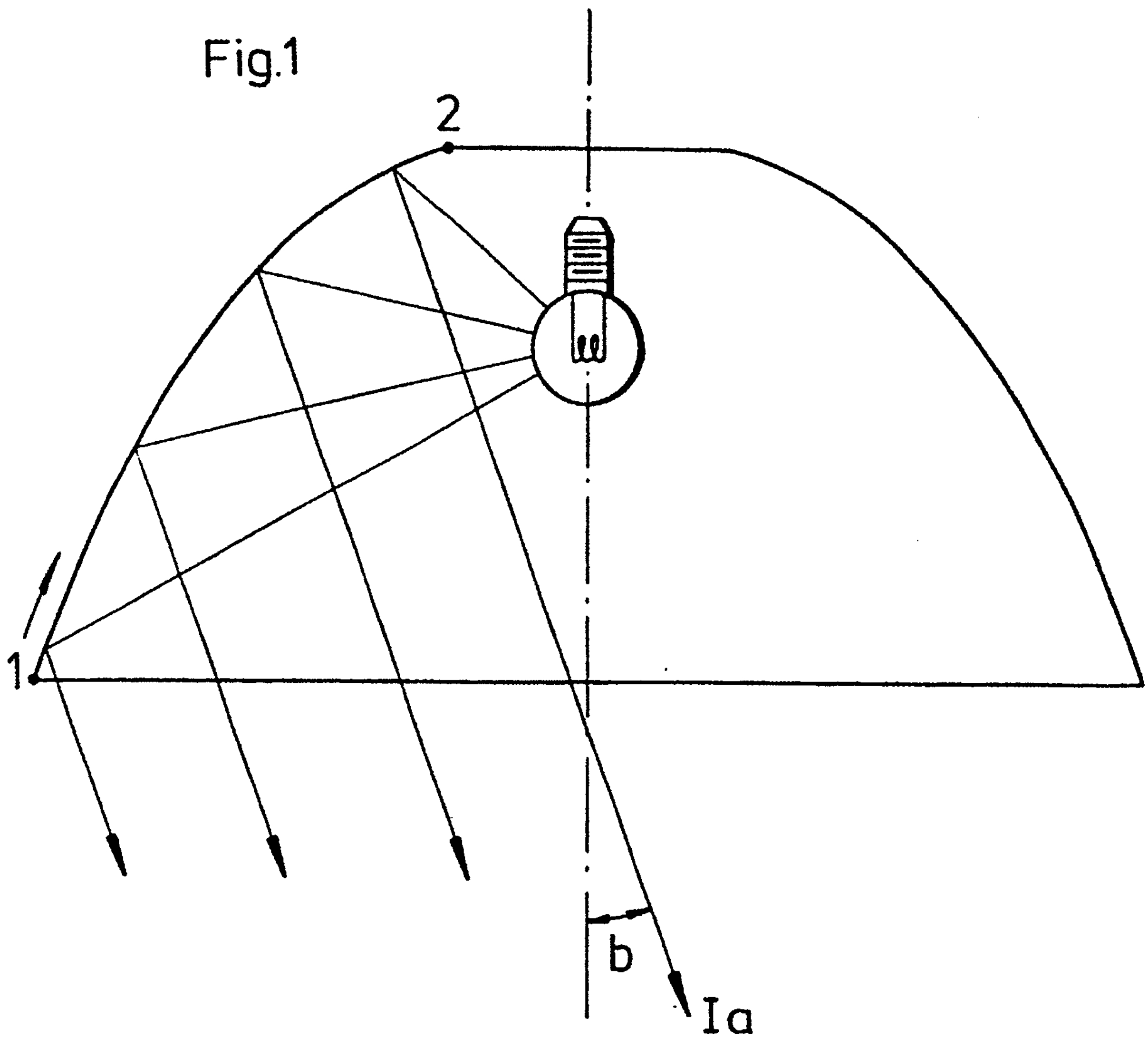
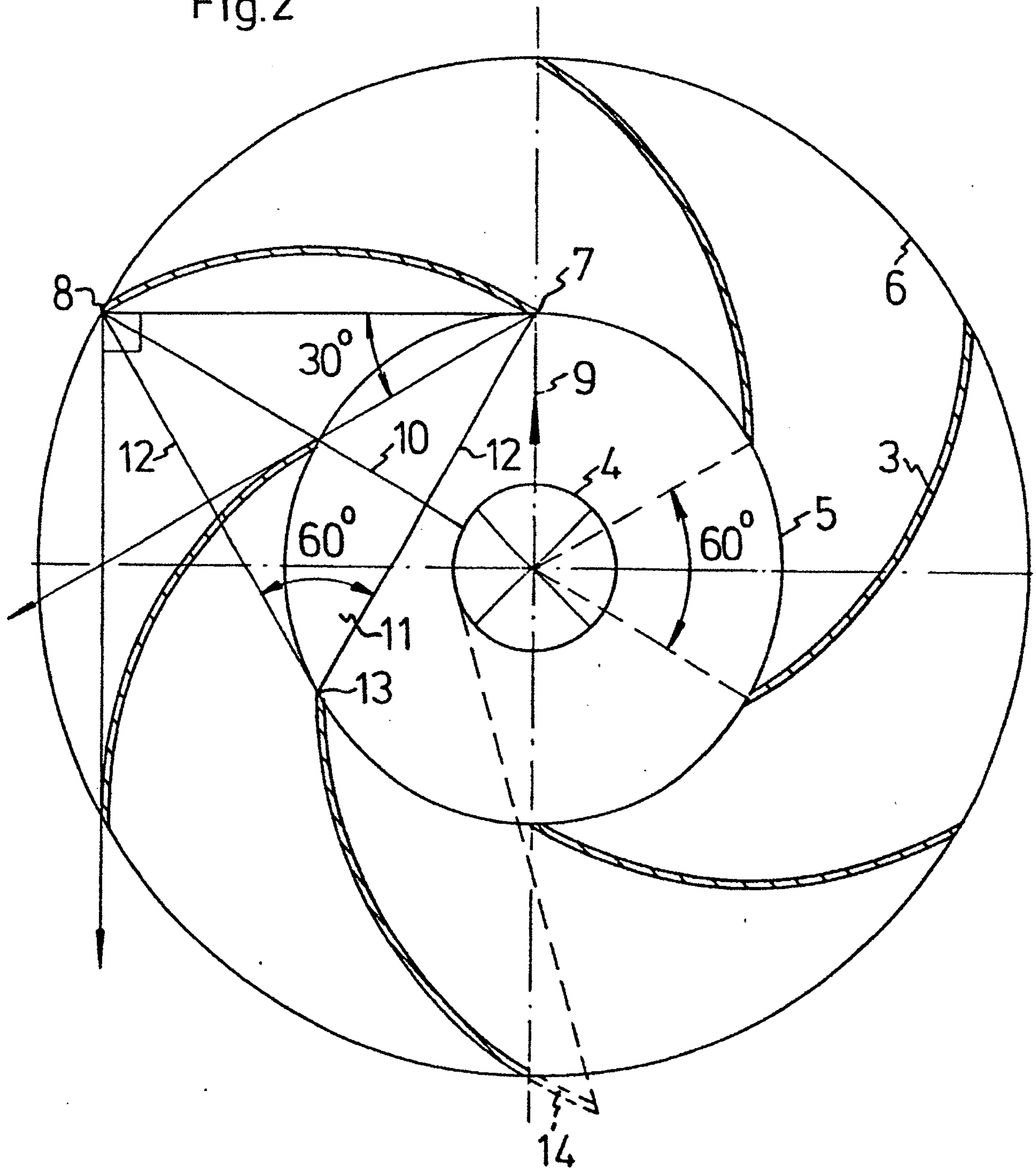


Fig.2



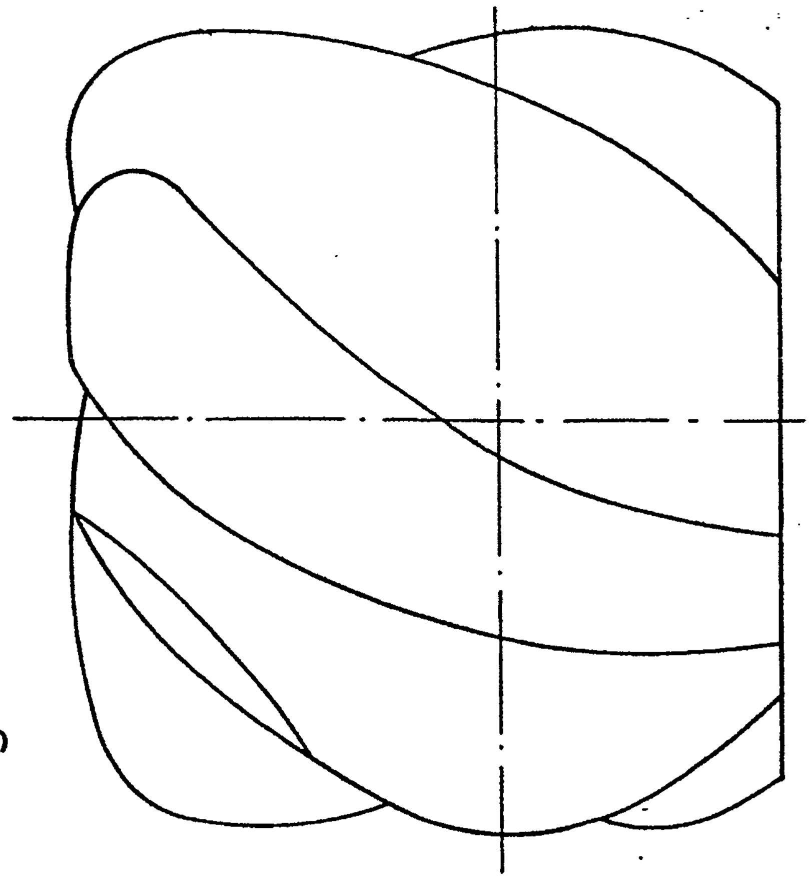


Fig. 4

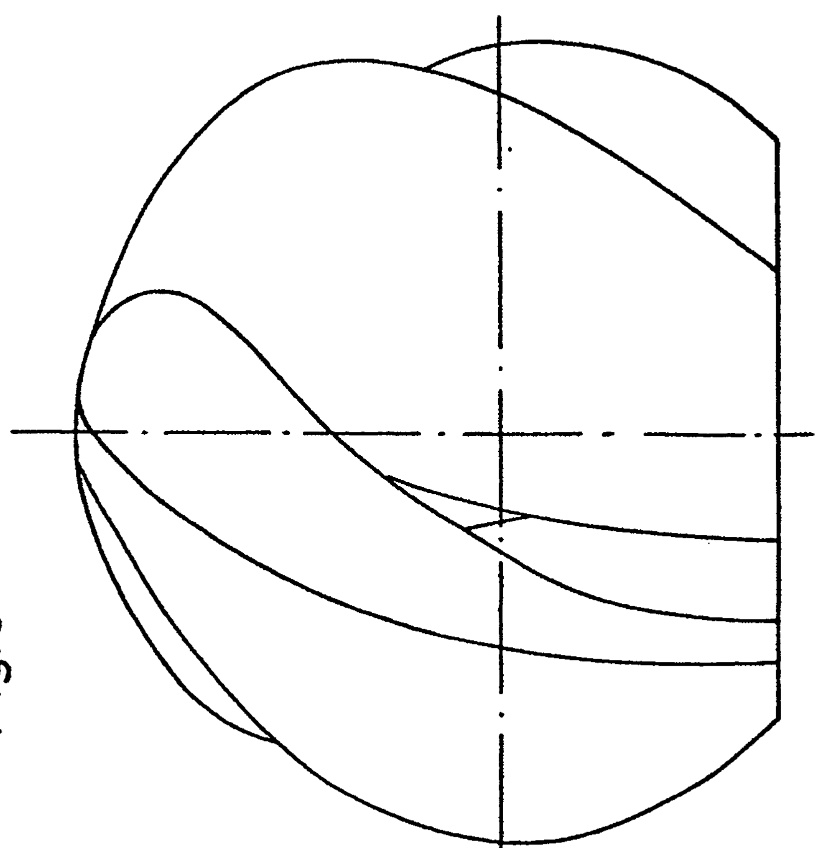


Fig. 3

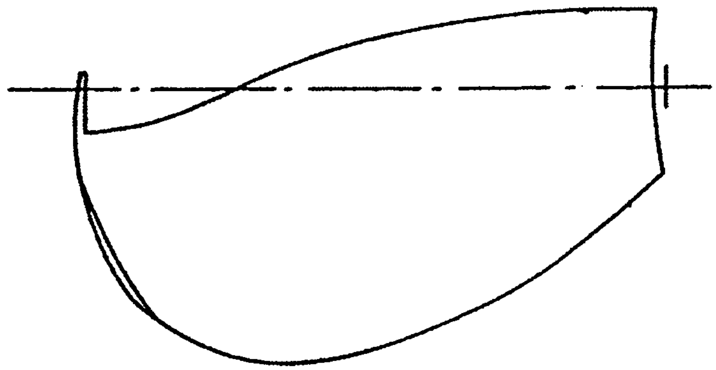


Fig.7

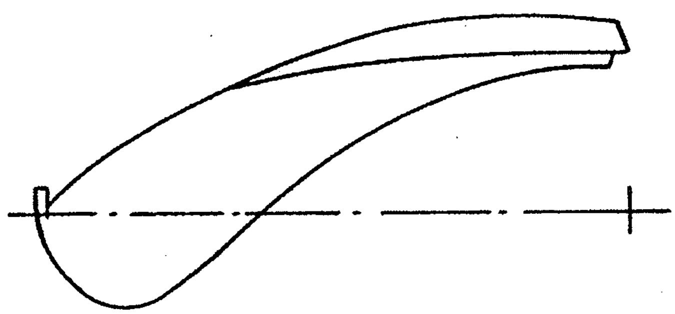


Fig.6

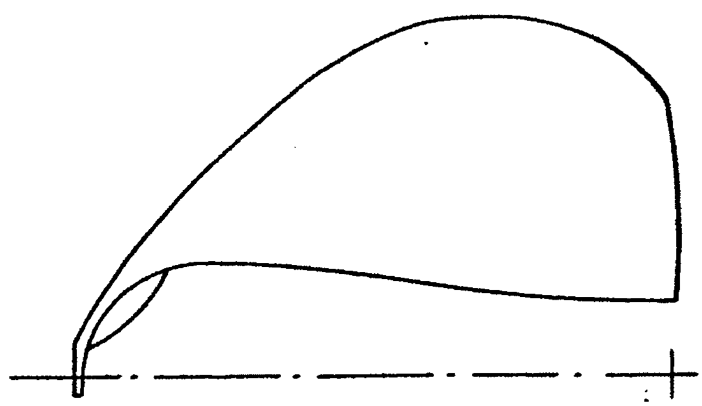


Fig.5

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EUROPEAN SEARCH REPORT

Application number

EP 83 85 0210

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	DE-C- 261 036 (SCHANZENBACH) * Figures 3-4 * ---	1,6	F 21 V 7/00
X	GB-A-1 365 504 (CHARLTON) * Figures 1-9 * ---	1	
A	GB-A- 527 804 (HANSSON) * Page 1, lines 102-105 * ---	1,2	
A	US-A-3 115 310 (HOFMAN) * Figures 3-4 * -----	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl. 3)

F 21 V
F 21 P
F 21 S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02-12-1983	FOUCRAY R.B.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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